CLAIMS

What is claimed is:

1. A vehicle comprising:

a vehicle glazing;

at least one wiper blade for moving across said glazing to remove raindrops from said glazing;

a controller operatively connected to said wiper blade for activating said wiper blade;

a piezoelectric sensor mounted to said glazing that produces an analog signal proportional to vibrations caused by raindrops striking said glazing;

an amplifier electrically connected to said piezoelectric sensor for increasing an amplitude of said analog signal;

an analog-to-digital converter electrically connected to said amplifier for converting said analog signal into digital values; and

a processor electrically connected to said analog-to-digital converter and said controller for computing a rain rate with said digital values in an equation derived from a point process equation and for providing said rain rate to said controller such that said controller automatically operates said wiper blade to remove raindrops based on said rain rate.

2. The vehicle as set forth in claim 1 wherein said equation derived from a point process equation is further defined as an exponential probability density function of a first order point process, said function defined by the equation $f(t) = \lambda e^{-\lambda t}$, where f(t) represents a theoretical form of the first order point process, λ

represents said rain rate, and t represents time between said raindrops striking said glazing.

3. The vehicle as set forth in claim 1 further comprising at least one motor operatively connected to said controller and said wiper blade for moving said wiper blade across said glazing.

4. The vehicle as set forth in claim 3 further comprising at least one switch operatively connected to said at least one motor and said controller for activating said at least one motor.

5. The vehicle as set forth in claim 1 further comprising a flexible circuit board for supporting and electrically connecting said piezoelectric sensor, said amplifier, said analog-to-digital converter, and said processor.

6. The vehicle as set forth in claim 5 wherein said flexible circuit board is affixed to said glazing.

7. The vehicle as set forth in claim 1 wherein said vehicle glazing is further defined as a first glazing pane and a second glazing pane.

8. The vehicle as set forth in claim 7 wherein said piezoelectric sensor is disposed between said first and second glazing panes.

9. The vehicle as set forth in claim 1 further comprising a microcontroller electrically connected to said amplifier and said controller wherein said analog-to-digital converter and said processor are components of said microcontroller.

10. The vehicle as set forth in claim 1 wherein said piezoelectric sensor is further defined as a high temperature thin film piezoelectric sensor.

11. The vehicle as set forth in claim 1 further comprising a filter operatively connected to said amplifier and said analog-to-digital converter for removing noise from said analog signal.

12. The vehicle as set forth in claim 11 further comprising a flexible circuit board for supporting and electrically connecting said piezoelectric sensor, said amplifier, said analog-to-digital converter, said filter, and said processor.

13. The vehicle as set forth in claim 12 wherein said flexible circuit board is affixed to said glazing.

14. The vehicle as set forth in claim 12 wherein said vehicle glazing is further defined as a first glazing pane and a second glazing pane.

15. The vehicle as set forth in claim 14 wherein said flexible circuit board is located between said first and second glazing panes.

16. A vehicle glazing for determining a rain rate, said glazing comprising:

at least one glazing pane;

a piezoelectric sensor mounted to said glazing pane and producing an analog signal proportional to vibrations caused by raindrops striking said glazing pane;

an amplifier electrically connected to said piezoelectric sensor for increasing an amplitude of said analog signal;

an analog-to-digital converter electrically connected to said amplifier for converting said analog signal into digital values; and

a processor electrically connected to said analog-to-digital converter for computing a rain rate with said digital values in an equation derived from a point process equation to determine the rain rate.

17. The vehicle glazing as set forth in claim 16 wherein said equation derived from a point process equation is an exponential probability density function of a first order point process, said function defined by the equation $f(t) = \lambda e^{-\lambda t}$, where f(t) represents a theoretical form of the first order point process, λ represents said rain rate, and t represents time between said raindrops striking said glazing.

18. The vehicle glazing as set forth in claim 16 further comprising a flexible circuit board for supporting and electrically connecting said piezoelectric sensor, said amplifier, said analog-to-digital converter, and said processor.

19. The vehicle as set forth in claim 18 wherein said flexible circuit board is affixed to said at least one glazing pane.

20. The vehicle glazing as set forth in claim 16 wherein said at least one glazing pane is further defined as a first glazing pane and a second glazing pane.

21. The vehicle as set forth in claim 20 wherein said piezoelectric sensor is located between said first and second glazing panes.

22. The vehicle glazing as set forth in claim 16 further comprising a microcontroller electrically connected to said amplifier and said controller wherein said analog-to-digital converter and said processor are components of said microcontroller.

23. The vehicle glazing as set forth in claim 16 wherein said piezoelectric sensor is a high temperature thin film piezoelectric sensor.

24. The vehicle glazing as set forth in claim 16 further comprising a filter operatively connected to said amplifier and said analog-to-digital converter for removing noise from said analog signal.

25. The vehicle glazing as set forth in claim 24, further comprising a flexible circuit board for supporting and electrically connecting said piezoelectric sensor, said amplifier, said analog-to-digital converter, said filter, and said processor.

26. The vehicle as set forth in claim 25 wherein said flexible circuit board is affixed to said at least one glazing pane.

27. The vehicle glazing as set forth in claim 25 wherein said at least one glazing pane is further defined as a first glazing pane and a second glazing pane.

28. The vehicle as set forth in claim 27 wherein said flexible circuit board is located between said first glazing pane and said second glazing pane.

29. A sensing device for determining a rain rate on a surface, said device comprising:

a piezoelectric sensor that produces an analog signal proportional to vibrations caused by raindrops striking the surface;

an amplifier operatively connected to said piezoelectric sensor for increasing an amplitude of said analog signal;

an analog-to-digital converter operatively connected to said amplifier for converting said analog signal into digital values; and

a processor operatively connected to said analog-to-digital converter for computing the rain rate using said digital values in an equation derived from a point process equation to determine the rain rate.

30. The sensing device as set forth in claim 29 wherein said equation derived from a point process equation is further defined as an exponential probability density function of a first order point process, said function defined by the equation $f(t) = \lambda e^{-\lambda t}$, where f(t) represents a theoretical form of the first order point process, λ represents said rain rate, and t represents time between said raindrops striking said surface.

31. The sensing device as set forth in claim 29 further comprising a microcontroller electrically connected to said amplifier and said controller wherein said analog-to-digital converter and said processor are components of said microcontroller.

32. The sensing device as set forth in claim 29 further comprising a microcontroller for performing the functions of said analog-to-digital converter and said processor.

33. The sensing device as set forth in claim 29 wherein said piezoelectric sensor is a high temperature thin film piezoelectric sensor.

34. The sensing device as set forth in claim 29 further comprising a filter operatively connected to said amplifier and said analog-to-digital converter for removing noise from said analog signal.

35. The sensing device as set forth in claim 34 further comprising a flexible circuit board for supporting and electrically connecting said piezoelectric sensor, said amplifier, said analog-to-digital converter, said filter, and said processor.